We claim:

1. An expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence all operatively linked.

2. The expression vector of claim 1, wherein said polynucleotide promoter sequence is selected from the group consisting of a constitutive promoter, an inducible promoter and a tissue specific promoter.

3. The expression vector of claim 2, wherein said constitutive promoter is selected from the group consisting of a simian virus 40 (SV40) early promoter, a mouse mammary tumor virus promoter, a human immunodeficiency virus long terminal repeat promoter, a Moloney virus promoter, an avian leukemia virus promoter, an Epstein-Barr virus immediate early promoter, a Rous sarcoma virus promoter, a human action promoter, a human myosin promoter, a human hemoglobin promoter, cytomegalovirus (CMV) promoter and a human muscle creatine promoter.

4. The expression vector of claim 2, wherein said inducible promoter is selected from the group consisting of a metallothionine promoter, a glucocorticoid promoter, a progesterone promoter, and a tetracycline promoter.

5. The expression vector of claim 2, wherein said tissue specific promoter is selected from the group consisting of HER-2 promoter and a PSA associated promoter.

6. The expression vector of claim 1, wherein said polynucleotide encoding a signal sequence is selected from the group consisting of a hepatitis B virus E

antigen signal sequence, an immunoglobulin heavy chain leader sequence, and a cytokine leader sequence.

7. The expression vector of claim 1, wherein said polynucleotide encoding an antigen comprises a polynucleotide sequence for at least one epitope, wherein said at least one epitope induces a B cell response in a mammal.

8. The expression vector of claim 1, wherein said polynucleotide encoding an antigen comprises a polynucleotide sequence for at least one epitope, wherein said at least one epitope induces a CD4+ T-cell response in a mammal.

9. The expression vector of claim 1, wherein said polynucleotide encoding an antigen comprises a polynucleotide sequence for at least one epitope, wherein said at least one epitope induces a CD8+ T-cell response in a mammal.

10. The expression vector of claim 1, wherein said polynucleotide encoding an antigen comprises a polynucleotide sequence for at least one epitope, wherein said at least one epitope induces a B cell response, a CD4+ T-cell response, and a CD8+ T-cell response in a mammal into which said antigen is introduced.

11. The expression vector of claim 1, wherein said polynucleotide encoding an antigen comprises a polynucleotide sequence for a plurality of epitopes, wherein said plurality of epitopes induces a B cell response, a CD4+ T-cell response, and a CD8+ T-cell response in a mammal into which said antigen is introduced.

12. The expression vector of claim 1, wherein said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence associated with a disease, wherein said disease is selected from the group consisting of infectious disease, cancer and autoimmune disease.

13. The expression vector of claim 12, wherein said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence from an infectious disease, wherein said infectious disease is caused by a pathogenic microorganism selected from the group consisting of virus, bacterium, fungus and protozoan.

14. The expression vector of claim 13, where said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence from a viral gene, wherein said viral gene is selected from the group consisting of hepatitis B virus, hepatitis C virus, human immunodeficiency virus, papillomavirus, and herpesvirus.

15. The expression vector of claim 14, wherein said hepatitis B virus is hepatitis B virus e antigen or the hepatitis B virus core antigen.

16. The expression vector of claim 14, wherein said human immunodeficiency virus is gp160 or gp120.

17. The expression vector of claim 14, wherein said papillomavirus is the papillomavirus E7 or papillomavirus E6.

18. The expression vector of claim 14, wherein said herpesvirus is selected from the group consisting of herpes simplex virus type 1, herpes simplex virus type 2, Epstein-Barr virus, cytomegalovirus, human herpes virus 6, human herpes virus 7 and human herpes virus 8.

19. The expression vector of claim 12, wherein the disease is selected from the group consisting of breast cancer, cervical cancer, melanoma, renal cancer and prostate cancer.

20. The expression vector of claim 1, wherein said polynucleotide encoding a sequence for an antigen is a polynucleotide sequence selected from the group consisting of polynucleotide sequences encoding tyrosinase, MART, trp, MAGE-1, MAGE-2, MAGE-3, gp100, HER-2, Ras and PSA.

21. The expression vector of claim 12, wherein the disease is selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis, psoriasis and Crohn's disease.

22. The expression vector of claim 1, wherein said polynucleotide encoding an antigen encodes a Fc antibody fragment or an interleukin.

23. The expression vector of claim 22, wherein the polynucleotide sequence encodes interleukin 5.

24. The expression vector of claim 1, wherein said polynucleotide encoding a cell binding element is a polynucleotide sequence of a ligand which binds to a cell surface receptor.

25. The expression vector of claim 24, wherein said polynucleotide sequence of a ligand is selected from the group consisting of polynucleotide sequences which encode a Fc fragment, a toxin cell binding domain, a cytokine, a small peptide and an antibody.

26. The expression vector of claim 25, wherein said polynucleotide sequence encodes a pseudomonas exotoxin cell binding domain.

27. The expression vector of claim 25, wherein said polynucleotide sequence encodes interleukin 5 or interleukin 6.

28. The expression vector of claim 1, wherein said polynucleotide encoding a cell binding element is a homologous polynucleotide sequence or a heterologous polynucleotide sequence.

29. The expression vector of claim 28, wherein said polynucleotide encoding a cell binding element is a homologous Fc fragment.

30. The expression vector of claim 28, wherein said polynucleotide encoding a cell binding element is a heterologous Fc fragment.

31. The expression vector of claim 1, wherein said expression vector further comprises an integration signal sequence which facilitates integration of said expression vector into the genome of the cell.

32. The expression vector of claim 31, wherein the integration signal sequence is a viral long terminal repeat sequence or an adeno-associated virus ITR sequence.

33. The expression vector of claim 1, wherein the vector is selected from the group consisting of viral vector, bacterial vector and mammalian vector.

34. A transformed cell comprising an expression vector, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence all operatively linked.

35. The cell of claim 34, wherein said cell is prokaryotic or eukaryotic.

36. The cell of claim 35, wherein said eukaryotic cell is selected from the group of eukaryotic cells consisting of yeast, insects, and mammals.

37. A fusion protein comprising a signal sequence, an antigen and a cell binding element.

38. A vaccine comprising an expression vector, wherein said expression vector comprises a polynucleotide encoding a promoter sequence, a polynucleotide encoding a secretion signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide encoding a polyadenylation sequence, wherein said sequences are operatively linked.

39. A vaccine comprising antigen presenting cells, wherein said antigen presenting cells are transduced *in vitro* with the fusion protein of claim 37.

40. A vaccine comprising antigen presenting cells, wherein said antigen presenting cells are transduced *in vitro* with the expression vector of claim 1.

41. A vaccine comprising the fusion protein of claim 37.

42. An expression vector comprising at least a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen and a polynucleotide encoding a cell binding element.

43. A method to elicit an immune response directed against an antigen, comprising the steps of:

introducing an expression vector into a cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding said antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked; and

expressing said vector to produce said antigen under conditions, wherein said antigen is secreted from the cell; said secreted antigen is endocytosed into the cell; said endocytosed antigen is processed inside the cell; and said processed antigen is presented to a cell surface protein, to elicit a T-cell mediated immune response.

44. The method of claim 43 wherein the processed antigen is presented to a cell surface protein selected from the group consisting of MHC-I, MHC-II or B-cells receptors.

45. The method of claim 43 wherein the antigen is secreted by a first cell and internalized by a second cell.

46. The method of claim 45 wherein the first cell and second cell are antigen presenting cells.

47. The method of claim 45 wherein the first cell is a non-antigen presenting cell and the second cell is an antigen presenting cell.

48. The method of claim 47 wherein the first cell is a muscle cell.

49. A method to elicit an immune response directed against an antigen comprising the step of administering the expression vector of claim 1 directly to a mammal via a parenteral route.

50. The method of claim 43, wherein said polynucleotide promoter sequence is selected from the group consisting of a constitutive promoter, an inducible promoter and a tissue specific promoter.

51. The method of claim 50, wherein said constitutive promoter is selected from the group consisting of a simian virus 40 (SV40) early promoter, a mouse

mammary tumor virus promoter, a human immunodeficiency virus long terminal repeat promoter, a Moloney virus promoter, an avian leukemia virus promoter, an Epstein-Barr virus immediate early promoter, a Rous sarcoma virus promoter, a human action promoter, a human myosin promoter, a human hemoglobin promoter, cytomegalovirus (CMV) promoter and a human muscle creatine promoter.

52. The method of claim 50, wherein said inducible promoter is selected from the group consisting of a metallothionine promoter, a glucocorticoid promoter, a progesterone promoter, and a tetracycline promoter.

53. The method of claim 50, wherein said tissue specific promoter is selected from the group consisting of HER-2 promoter and a PSA associated promoter.

54. The method of claim 43, wherein said polynucleotide encoding a signal sequence is selected from the group consisting of a hepatitis B virus e antigen signal sequence, an immunoglobulin heavy chain leader sequence, and a cytokine leader sequence.

55. The method of claim 43, wherein said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence associated with a disease, wherein said disease is selected from the group consisting of infectious disease, cancer and autoimmune disease.

56. The method of claim 55, wherein said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence from an infectious disease, wherein said infectious disease is caused by a pathogenic microorganism selected from the group consisting of virus, bacterium, fungus and protozoan.

57. The method of claim 56, where said polynucleotide encoding an antigen is a polynucleotide sequence selected from at least one polynucleotide sequence from a viral gene, wherein said viral gene is selected from the group consisting of hepatitis B virus, hepatitis C virus, human immunodeficiency virus, papillomavirus, and herpesvirus.

58. The method of claim 57, wherein said hepatitis B virus is hepatitis B virus e antigen or the hepatitis B virus core antigen.

59. The method of claim 57, wherein said human immunodeficiency virus is gp160 or gp120.

60. The method of claim 57, wherein said papillomavirus is the papillomavirus E7 or papillomavirus E6.

61. The method of claim 57, wherein said herpes virus is selected from the group consisting of herpes simplex virus type 1, herpes simplex virus type 2, Epstein-Barr virus, a cytomegalovirus, a human herpes virus 6, a human herpes virus 7 and a human herpes virus 8.

62. The method of claim 55, wherein the disease is selected from the group consisting of breast cancer, cervical cancer, melanoma, renal cancer and prostate cancer.

63. The method of claim 55, wherein the disease is selected from the group consisting of rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis, psoriasis and Crohn's disease.

64. The method of claim 43, wherein said polynucleotide encoding an antigen encodes an Fc antibody fragment or an interleukin.

65. The method of claim 64, wherein the polynucleotide sequence encodes interleukin 5.

66. The method of claim 43, wherein said polynucleotide encoding a cell binding element is a polynucleotide sequence of a ligand which binds to a cell surface receptor.

67. The method of claim 66, wherein said polynucleotide sequence of a ligand is selected from a group consisting of polynucleotide sequences which encodes a Fc fragment, a toxin cell binding domain, a cytokine, a small peptide and an antibody.

68. The method of claim 67, wherein said polynucleotide sequence encodes a pseudomonas exotoxin cell binding domain.

69. The method of claim 67, wherein said polynucleotide sequence encodes interleukin 5 or interleukin 6.

70. The method of claim 43, wherein said polynucleotide encoding a cell binding element is a homologous polynucleotide sequence or a heterologous polynucleotide sequence.

71. The method of claim 70, wherein said polynucleotide encoding a cell binding element is a homologous Fc fragment.

72. The method of claim 70, wherein said polynucleotide encoding a cell binding element is a heterologous Fc fragment.

73. The method of claim 43, wherein said expression vector further comprises an integration signal sequence which facilitates integration of said expression vector into the genome of the cell.

74. The method of claim 73, wherein integration signal sequence is a viral long terminal repeat sequence or an adeno-associated virus ITR sequence.

75. The method of claim 43, wherein the vector is selected from the group consisting of viral vector, bacterial vector and mammalian vector.

76. A method to identify a polynucleotide sequence which encodes at least one MHC-II restricted epitope that is capable of activating CD4+ helper T cells, said method comprising the steps of:

introducing an expression vector into an antigen presenting cell to produce a transduced antigen presenting cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked;

contacting said transduced antigen presenting cell with naive T-cells or primed T-cells; and

assessing whether any naive T-cells or primed T cells are activated upon contact with said transduced antigen presenting cell wherein activation of said T-cells indicates that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells.

77. The method of claim 76, wherein the polynucleotide encoding a test polypeptide is a cDNA library isolated from tumor cell lines.

78. The method of claim 76, wherein the polynucleotide encoding a test polypeptide is selected from the group of cDNA libraries consisting of viral genomes, bacterial genomes, parasitic genomes, and human genomes.

79. A method to identify a polynucleotide sequence which encodes at least one MHC-II restricted epitope that is capable of eliciting an immune response *in vivo*, said method comprising the steps of:

introducing an expression vector into antigen presenting cells to produce transduced antigen presenting cells, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked;

administering said transduced antigen presenting cells to a mammal via a parenteral route;

collecting T-cells from splenocytes and co-culturing with dendritic cells; and

assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a polynucleotide sequence or fragment thereof capable of activating CD4+ helper T cells.

80. The method of claim 79, wherein the polynucleotide encoding a test polypeptide is a cDNA library isolated from tumor cell lines.

81. The method of claim 79, wherein the polynucleotide encoding a test polypeptide is selected from the group of cDNA libraries consisting of viral genomes, bacterial genomes, parasitic genomes, and human genomes.

82. A method to identify a polynucleotide sequence which encodes at least one MHC-II restricted epitope that is capable of eliciting an immune response *in vivo*, said method comprising the steps of:

administering to a mammal via a parenteral route an expression vector, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked;

collecting T-cells from splenocytes and co-culturing with dendritic cells; and

assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a polynucleotide sequence or fragment thereof capable of activating CD4+ helper T cells.

83. The method of claim 82, wherein the polynucleotide encoding a test polypeptide is a cDNA library isolated from tumor cell lines.

84. The method of claim 82, wherein the polynucleotide encoding a test polypeptide is selected from the group of cDNA libraries consisting of viral genomes, bacterial genomes, parasitic genomes, and human genomes.

85. A method of treating cancer comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering antigen presenting cells to a mammal via a parenteral route, wherein said antigen presenting cells are transduced with the test polypeptide.

86. A method of treating cancer comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering to a mammal via a parenteral route an expression vector, wherein said expression vector comprises at least the polynucleotide encoding the test polypeptide and a polynucleotide encoding a cell binding element.

87. A method of treating a viral infection comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering antigen presenting cells to a mammal via a parenteral route, wherein said antigen presenting cells are transduced with the test polypeptide.

88. A method of treating a viral infection comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering to a mammal via a parenteral route an expression vector, wherein said expression vector comprises at least the polynucleotide encoding the test polypeptide and a polynucleotide encoding a cell binding element.

89. A method of treating an autoimmune disease comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering antigen presenting cells to a mammal via a parenteral route, wherein said antigen presenting cells are transduced with the test polypeptide.

90. A method of treating autoimmune disease comprising the steps of:

identifying a test polypeptide which encodes at least one MHC-II restricted epitope, wherein said polypeptide is identified under the conditions of transducing antigen presenting cells with an expression vector comprising a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a test polypeptide, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked and assessing activation of T-cells wherein said activation of T-cells indicate that the polynucleotide encoding the test polypeptide is a gene or fragment thereof capable of activating CD4+ helper T cells; and

administering to a mammal via a parenteral route an expression vector, wherein said expression vector comprises at least the polynucleotide sequence encoding the test polypeptide and a polynucleotide encoding a cell binding element.

91. A method of producing a vaccine to immunize an mammal comprising the steps of:

transducing antigen presenting cells by introducing an expression vector into said antigen presenting cells to produce a transduced antigen presenting cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked; and

expressing said vector to produce an antigen under conditions wherein said antigen is secreted from the cell.

92. A method of administering the vaccine of claim 41, wherein antigen presenting cells are transduced with the vaccine *in vitro* prior to administering to a mammal.

93. A method of administering the vaccine of claim 38, wherein the vaccine is administered parenterally.

94. A method of administering the vaccine of claim 41, wherein antigen presenting cells are transduced with the vaccine *ex vivo* prior to administering to a mammal.

95. A method of inducing an immune response comprising the steps of co-administering to a mammal a cytokine expression vector and a retrogen expression vector, wherein the retrogen expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence all operatively linked.

96. The method of claim 95, wherein the cytokine expression vector contains the sequence for GM-CSF.

97. The method of claim 95, wherein the cytokine expression vector contains the sequence for IL-2.

98. A method of inducing an immune response comprising the steps of administering to a mammal one expression vector, wherein said expression vector comprises a polynucleotide sequence encoding a cytokine protein and a polynucleotide sequence encoding a fusion protein under transcriptional control of

one promoter, wherein said fusion protein comprises a signal sequence, an antigen and a cell binding element.

99. The method of claim 98, wherein the polynucleotide sequence encoding the cytokine protein and the polynucleotide sequence encoding the fusion protein are under separate transcriptional control, and wherein the polynucleotide sequence encoding the cytokine protein and the polynucleotide sequence encoding the fusion protein are in tandem in the one expression vector.

100. A method of inducing an immune response comprising the steps of co-administering to a mammal two different retrogen expression vectors, wherein a first retrogen expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a first antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence all operatively linked; and a second retrogen expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a second antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence all operatively linked.

101. A method of inducing an immune response comprising the steps of administering to a mammal one expression vector, wherein said expression vector comprises a polynucleotide sequence encoding a first fusion protein and a polynucleotide sequence encoding a second fusion protein under transcriptional control of one promoter, wherein said first fusion protein comprises a first signal sequence, a first antigen and a first cell binding element and said second fusion protein comprises a second signal sequence, a second antigen and a second cell binding element.

102. The method of claim 101, wherein said first and second signal sequences are the same signal sequence, first and second antigens are different antigens and said first and second cell binding elements are an Fc fragment.

103. The method of claim 101, wherein said first and second signal sequences are the same signal sequence, first and second antigens are different antigens and said first and second cell binding elements are the same cell binding element.

104. The method of claim 101, wherein said first and second signal sequences are different signal sequences, first and second antigens are different antigens and said first and second cell binding elements are the same cell binding element.

105. The method of claim 101, wherein said first and second signal sequences are the same signal sequence, first and second antigens are different antigens and said first and second cell binding elements are different cell binding elements.

106. The method of claim 101, wherein said first and second signal sequences are different signal sequences, first and second antigens are different antigens, and said first and second cell binding elements are different cell binding elements.

107. The method of claim 101, wherein the polynucleotide sequence encoding the first fusion protein and the polynucleotide sequence encoding the second fusion protein are under separate transcriptional control, and wherein the polynucleotide sequence encoding the first fusion protein and the polynucleotide sequence encoding the second fusion protein are in tandem in one expression vector.

108. A method of simultaneously inducing both CD4+ and CD8+ T-cells comprising the steps of administering a fusion protein, wherein the protein comprises both a MHC-I and MHC-II epitope fused to a cell binding element.

109. A method of producing a fusion protein comprising the steps of:

transducing an antigen presenting cell by introducing an expression vector into said antigen presenting cell to produce a transduced antigen presenting cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an antigen, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked; and

expressing said vector to produce a fusion protein under conditions, wherein said fusion protein is secreted from the cell.

110. A method of administering a fusion protein comprising administering antigen presenting cells transduced with the fusion protein *in vitro* prior to administering to a mammal.

111. A method of administering a fusion protein comprising administering the fusion protein parenterally to a mammal.

112. A method of secreting an intracellular protein comprising the steps of:

introducing an expression vector into a cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding an intracellular protein, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked; and

expressing said vector to produce a fusion protein under conditions, wherein said fusion protein is secreted from the cell.

113. The method of claim 112, wherein a region of said polynucleotide encoding an intracellular protein is truncated to increase the efficiency of secretion.

114. The method of claim 112, wherein a region of said polynucleotide encoding an intracellular protein is mutated to increase the efficiency of secretion.

115. The method of claim 112, wherein said polynucleotide encoding an intracellular protein is HPV 16 E7.

116. A method of secreting a membrane protein comprising the steps of:

introducing an expression vector into a cell, wherein said expression vector comprises a polynucleotide promoter sequence, a polynucleotide encoding a signal sequence, a polynucleotide encoding a membrane protein, a polynucleotide encoding a cell binding element, and a polynucleotide polyadenylation sequence, all operatively linked; and

expressing said vector to produce a fusion protein under conditions, wherein said fusion protein is secreted from the cell.

117. The method of claim 116, wherein a region of said polynucleotide encoding a membrane protein is truncated to increase the efficiency of secretion.

118. The method of claim 116, wherein a region of said polynucleotide encoding a membrane protein is mutated to increase the efficiency of secretion.

119. The method of claim 116, wherein said polynucleotide encoding a membrane protein is EBV nuclear antigen 1.